Original Paper

An Application Study on AI Educational Robots in Spoken English Exercises of Chinese Primary Schools

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Abstract

China's primary schools offer limited English courses, and the society lacks the environment for naturally acquiring English in everyday life. Students typically have weak spoken English abilities and inadequate application of English. With the aim of addressing this issue, 79 fifth-graders from China's Hangzhou L elementary school participated in a one-semester AI-assisted English-speaking practice experiment. The control class practiced spoken English by reading English texts aloud, whereas the experimental class practiced for 30 minutes a day using the "AI educational robots + graded picture books + role play" approach. According to the results of the experiment's post-test, Chinese primary school students regarded the experimental class's acquisition mode to be highly appealing, this approach was well accepted by both students and parents and brought enthusiasm and good effect of spoken English exercise. The experimental class's average daily reading time for English role-play reading grew by about 30 minutes, the amount of reading increased by five times, the amount of time spent watching cartoons and playing video games fell by nearly 28 minutes, and the spoken English score climbed by 37 points, representing an increase of 82% when compared to the control class; Additionally, the standard level of pronunciation and intonation has increased by two grades, from "poor" to "good," and the English final exam scores have increased by roughly 8%. However, there has not been a considerable change in the aforementioned control class indicators. This AI-assisted second language practice technique is affordable, efficient, and helpful and has good implications for second language acquisition in other countries.

Keywords

Chinese elementary schools, AI-assistance, English speaking exercise, experiment

1. Introduction

With around 40 students in each class and limited class time—typically 2-3 class hours per week—the English curriculum in Chinese elementary schools now makes it impossible for teachers to adequately care for each student. Additionally, pupils have few opportunities to practice spoken English in class and receive little after-class English conversation practice, which results in poor overall English-speaking competence and a major "dumb" English problem (Wang, 2020; Zhao, 2018). Students have neither a second language acquisition environment nor daily communicative needs, and there are few opportunities for teacher-student and student-student interaction and practice in the English class, making it difficult for them to exercise their English speaking skills; in addition, speaking instruction in English is often difficult to carry out alone and usually appears in the class in an incidental state, and final English exams do not test speaking items, so Chinese students generally lack basic English oral communication skills (Deng, 2018). Families who can afford it will send their children to extracurricular English extracurricular classes to improve their English through increased interactive practice of spoken English; however, English tutoring classes charge high fees, ranging from 100-200 RMB per hour, and it is difficult for low-income families, especially those in mountainous rural areas, to allow their children to improve their English skills through this route (Liu, 2021). English is now a global language, therefore a lack of proficiency in it can substantially impede one's ability to advance academically and professionally (Su, 2020).

Although many teachers have adopted a variety of teaching reform methods such as task teaching method, contextual teaching method, multimedia reading aloud method and game teaching method in elementary school English teaching in recent years, the problem of limited teaching class time and extracurricular practice has not been solved, and it is still difficult to improve elementary school students' English application skills, especially speaking skills significantly, and the majority of teachers and students are looking forward to finding an economical, convenient and effective way to practice spoken English (Zhang, 2021).

For this reason, the research group proposed to use AI educational robots to practice spoken English through the AI-assisted model of "graded picture books + role-playing", hoping to help solve this problem. The AI educational robot is an intelligent learning computer with a 7-10 inch tablet learning machine installed on a robot toy, which has a cute robot appearance, and can dance and sing. Many English picture books and other reading resources are already included in it, along with AI interactive reading with sound, bilingual translation, follow-along recording and scoring and error correction, and more. The low-cost product is ideal for elementary school pupils to study English because it costs less than 1,000 RMB, which is just a few English-speaking training class fees. By completing role-plays based on picture books and receiving real-time evaluation results, effective human-computer interaction features can encourage children to practice spoken English. Increasing the number of time students spend actively speaking and listening to English outside of class will inevitably raise their ability to understand and produce English outside of class as well as improve their reading comprehension and

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listening abilities, making this model of English speaking acquisition high-quality and consistent with the Input-Output Theory of Second Language Acquisition (Krashen, 2018; Patrick, 2019).

Currently, many teachers read PPTs while using tablets to help with primary school English instruction, which lacks engagement and has an unsatisfactory learning outcome (Reich, 2019; Al Mehairy, 2017; Ge, 2020; Jia, 2019). Contrarily, elementary school pupils may spend time playing more involved video games (Qiao, 2020), which implies that the degree of interaction of the e-learning courseware has a significant impact on how effectively children learn using e-learning courseware (Oakley, 2020; Jin, 2019). Students may be able to attain great learning efficiency if the e-learning courseware is designed and delivered in accordance with the Cognitive Theory of Multimedia Learning (Liao, 2019; Korbach, 2017).

This study's domestic AI educational robot is an improved version of the tablet learning machine. The presentation and interaction mode of its reading materials are also more consistent with the 10 Principles of Multimedia Learning Cognitive Theory because its design function and electronic courseware are more interactive than tablet computers (Hisao et al., 2019; Lee et al., 2019).

The literature study did not turn up any studies on the use of educational robots to help students improve their spoken English, but application tests are still needed to confirm how useful AI robots are in the real world for helping people practice speaking English.

2. Experiment Design

2.1 Experiment Purpose and Content

The goal of this experiment is to test the effect of this AI-assisted spoken English practice mode by using AI educational robots to implement the experiment of "graded picture book + role play." The research questions are:

(1) How did the subjects' spoken English proficiency, practice time and amount of reading, listening, and speaking in English change before and after the experiment?

(2) What impact does this AI-assisted spoken practice mode have on the Chinese primary school students' study attitude and study performance of spoken English? What is the acceptance rate of students and parents?

(3) What are the main influencing factors and improvement measures of the oral practice effect of this mode?

2.2 Experimental Subjects

In Hangzhou L Primary School, 79 primary school children from 2 classes of grade 5 who had similar English proficiency levels were chosen at random to participate in the experiment. One class of 40 students served as the experimental class, receiving two AI robots and a free customized English-speaking practice plan to direct the group's activities for one semester (4 months); the other class of 39 students served as the control class, which did not engage in AI-assisted speaking practice and maintained the previous level of limited English speaking practice.

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2.3 Speaking Practice Materials

The robot built-in Chinese English bilingual electronic picture books of *Lisheng Adventure Story Island*, which was introduced and published by China Foreign Language Teaching and Research Press. There are 63 books at levels 1 through 7, making it a good choice for primary school pupils to read. Each book is roughly 25 pages long, with 40 English words on average per page for a total of 60,000 English words. Each tale is captivating and very appealing to young readers.

2.4 Practice Mode

1) Experimental class

(1) The research participants used the educational robot to adopt the "graded picture book + role-playing" practice model with AI assistance. They were split up into groups, with 4-5 pupils in each group in the experimental class. They honed their spoken English skills through role-playing, reading, and imitation and then altered their performance based on their scores marked by AI robots. They worked out for 20 to 30 minutes on average 1-2 times every day. The practice schedule is graded in accordance with the difficulty order of picture books. Every week, on average, two to three picture books were used to practice two to three times in role-playing mode.

(2) The exercises were scheduled in the afternoon after class, and the educational robot was set to record the usage data such as time of use, exercise content, frequency, and score each time, in order to control the usage time of elementary school students for effective vision protection and for the researcher to analyze the experimental effect and the influencing factors.

(3) A WeChat group was created, and members of the research group rotated to provide online guidance, be responsible for journal records and statistical comparison, identify problems, solve them in time, and praise students who have completed their practice tasks well.

(4) The research group encouraged and guided students in the experimental group to carry out English drama performance activities in groups or in whole class, create English environments, and promote English communication practice.

2) Control class

AI-assisted spoken practice was not carried out, and the original spoken English practice mode of reading texts by students themselves will remain unchanged. Generally speaking, students read aloud 2-3 times a week for about 10 minutes each time.

2.5 Research Tools

(1) The Spoken English Skills Test Paper referred to the *Cambridge Children's Spoken English Test Paper* (University of Cambridge ESOL Examination Department, 2014). Two sets of spoken English ability test papers for primary school students with the same difficulty level and question type are compiled to test before and after the experiment. Each set of 10 questions, with a full score of 100, can be completed within 15 minutes, so as to evaluate the changes in the spoken English ability of the experimental subjects before and after the experiment. Among them, the pronunciation and intonation standard level is divided into four grades according to the BBC standard: excellent, good, average and poor.

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(2) English scores were compared according to the subjects' final examination scores before and after the experiment.

(3) The Questionnaire on AI-assisted Spoken English Practice of Primary School Students and The Outline of Interview on Spoken English Practice of Primary School Students were prepared to investigate spoken English practice.

The questionnaire includes 13 questions in 5 dimensions, including the situation of spoken English practice before and after the experiment, the acceptance of students and parents for the AI-assisted spoken English practice mode, the change of spoken English pronunciation and intonation standard level, spoken ability, and interest in English learning.

The interview outline was also carried out around the above five dimensions, and group interviews were conducted with the experimental subjects and their parents.

The questionnaire had been tried out and modified by experts. The overall Cronbach's alpha coefficient is higher than 0.85, which has high reliability and validity.

3. Results and Analysis

3.1 Analysis of Pre-test Results

According to the survey, most Chinese primary schools only provide English instruction starting in the third grade, and English is no longer one of the core subjects. The content of English textbooks is relatively simple, with a vocabulary of about 12,000 words in the fifth-grade English textbooks. In the 30-minute daily morning self-study, students in both the experimental class and the control class are typically assigned to read the English textbook for 10 minutes. They do not embrace this practice approach very well and show little interest in or passion for practicing English. Their intonation and pronunciation of English are not very standard, only reaching a "poor" level. The average scores of the two classes in the spoken English test and the final English test of the previous semester were about 45 and 77 points (out of 100 points) respectively, and the average time of watching cartoons and playing video games was roughly 3.3 hours per day. There was no significant difference between them. See Table 1 for details.

Table 1. Comparison of English Speaking Practice before the Experiment

Test Items	Experimental Class N=40 people	Control class N=39 people	P
English speaking practice mode	Read the text aloud	Read the text aloud	
Whether you like the content of the reading	Neutral	Neutral	
Interest and motivation in practicing spoken English	Neutral	Neutral	
Average practice time per day (minutes)	9.95	10.07	0.207
English speaking test scores (points out of 100)	45.13	44.89	0.152

Standard level of pronunciation	Poor	Poor	
Average daily time spent watching cartoons and playing video games (hours)	3.27	3.31	0.261
English test scores in the previous semester (points out of 100)	77.33	77.51	0.135

3.2 Post-test Results Analysis

The experimental class also engaged in 30 minutes of AI-assisted English role-play reading exercises in their free time each day, in addition to reading English textbooks for 10 minutes every morning. Therefore, the average daily English reading time per student in the experimental class is 38.43 minutes. Some students increased their own role-play reading time on weekends. Over the course of the four-month study period, each participant read 76.86 hours and about 60,000 words in English on average.

Table 2. Comparison of English Speaking Practice after the Experiment

Test Items	Experimental Class N=40 people	Control class N=39 people	P
English speaking practice mode	AI Assisted picture book role-play	Read the text aloud	
Whether you like the content of the reading	Strongly agree	Neutral	
Four months of reading aloud in English (words)	60,000	12,000	.000
Interest and motivation in English-speaking practice	Strongly high	Neutral	
Daily average practice time per student (minutes)	38.43	10.07	.000
Average total practice time per student in four months (hours)	76.86	14.67	.000
English speaking test scores (points out of 100)	82.56	45.27	.000
Proportion of improvement over previous test (%)	82.94	0.85	.000
Standard level of English pronunciation	Better	Poor	
Proportion of improvement over previous test (%)	2 levels	No change	
Average daily time spent watching cartoons and playing video games (hours)	2.86	3.32	.000
Changes from the previous survey (%)	-12.54	+0.30	.000
Final English test score (points out of 100)	83.7	78.32	.000
Change from previous semester (%)	+8.29	+1.04	.000

Students in the experimental class strongly like reading adventure stories from picture books. They repeated role-play and read some wonderful plots, and they could even recite these plots. For a "group cooperation role-play" PK activity, they could send English role-play videos to the class's Wechat group. The experimental class's students who participated in the post-experimental interview stated that this spoken English practice is excellent for developing a sense of teamwork.

The English pronunciation level of students in the experimental class increased by two grades compared to the previous test, achieving "good" with the use of AI for standard dubbing of instructional robots; the average score on the spoken English post-test was 82.56, up 82.94% from the spoken English pre-test; the average score on the final English exam was 83.74, increased 8.29% from the previous semester; he daily average time for watching cartoons and playing video games was 2.86 hours, dropping 12.54% from the pre-experiment survey. These indicators underwent considerable changes when compared to the control class, with statistically significant differences. For more details, see Table 2.

Except for reading English textbooks for 10 minutes in the morning, students in the control class basically did not read English textbooks in their spare time.

Therefore, during the 4-month experiment (88 school days), they only read English textbooks for 10 minutes on school days. Their average practice time of spoken English is 14.67 hours, and their average reading amount is about 12,000 words. Compared with the pre-test, their post-test results of spoken English, the standard of pronunciation and intonation, the average daily time spent watching cartoons and playing video games, and the average score of the final English test have not changed significantly.

Table 3. Students' and Parents' Approval of the Two Speaking Practice Modes (N=40)

Survey Items	Experimental Class		Control Class	
	N=40 people	%	N=39 people	%
Students who strongly like the mode	37	92.50	15	38.46
Students who like the mode	3	7.50	11	28.21
Students who do not like this mode	0		13	33.33
Students who wish to continue using this mode	40	100	20	61.54
Parents who accept the mode	40	100	27	69.23
Parents who do not accept the mode	0	0	12	30.77

The survey also has found that 92.5% of students in the experimental class strongly like the "AI-assisted role-play" spoken English practice mode, 7.5% like it, and none dislike it. Parents who approved of this practice mode were also 100%.

Only 38.46% of students in the control group strongly like the method of reading texts to practice spoken English, 28.21% like it, and 33.33% do not like it. Students in the control group considered this

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method to practice spoken English was monotonous and dull. Furthermore, 30.77% of the parents do not accept this method. For more details, see Table 3.

4. Discussion and Conclusion

According to the results of a comparison experiment lasting one semester (four months), Chinese primary school students find the experimental class's AI-assisted "graded picture book + role-play" practice mode for spoken English to be particularly appealing. The enthusiasm and effect of spoken English practice are good, and the acceptance of students and parents is very high. Compared with the control class, the average reading time of English for students in the experimental class increased by about 30 minutes per day, the reading amount increased by five times, whereas the time to watch cartoons and play video games decreased by nearly 28 minutes, the spoken English score increased by 37 points, with an increase of 82%, and the final English examination score also increased by about 8%. In addition, The pronunciation and intonation standard level of students in the experimental class increased by two grades from "poor" to "good".

However, for the control class, which adopted the conventional method of reading English texts and practicing spoken English, the changes in the above indicators are not significant enough.

In addition to having few English class hours in primary and secondary schools and very expensive English tutoring sessions, China lacks the social milieu necessary for the acquisition of English. The most cost-effective way for primary school students to improve their spoken English is to use educational robots to carry out AI-assisted role-play exercises. This actually creates an effective context for English acquisition, allowing children to practice their spoken English in role-play and reading PK activities and feel happy and successful as a result. Meaning spending time on this activity every day naturally reduces the time spent watching cartoons and playing video games. Children can now be enticed by reading materials that are appealing to them to increase the amount of time they spend practicing English role-play, and if they persist for a few months, they will inevitably improve their practice outcomes. Other nations can also employ this AI-assisted spoken language practice method for second language learning.

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